

Unless someone like you cares a whole awful lot, nothing is going to get better. It's Not.
- Dr. Seuss, The Lorax

UNIT I

THE BIG CLIMATE CHANGE EXPERIMENT

Lesson 1: Pre-Exploration



Unit I Guiding Question

Does the world's rising temperature affect me?

A NOTE FROM THE HOT AUTHORS

The Hot: One World, One Climate curriculum and simulation is a collaborative effort among secondary teachers, educational experts and journalists with faculty and staff from the NASA Goddard Institute for Space Studies (GISS) and the Columbia University Earth Institute. This interdisciplinary team – known as The GISS Climate Education Advisory Group – has been able to draw on many perspectives and areas of expertise to advance a real world, problem-based approach for student learning around many climate change topics.

The curriculum is designed to reinforce academic knowledge and skills outlined in national education standards with an eye toward student inquiry and research-like experiences. While exploring the science and stories of climate change, our goal is for students to use scientific research to build science and climate literacy, evaluate climate change solutions and develop 21st Century skills for informed civic engagement.

Our development process has been an iterative. The Climate Change in the Classroom (CCIC) Teacher Workshop at NASA GISS/Columbia University is a continuation of this process as we broaden the Hot collaboration to include the review, critique and recommendations more scientists and educators from 5 U.S. states.

It is important to note that we are in the active stage of review and development of the Hot curriculum and simulation. Hence, the materials being field-tested in the CCIC are not in their final form and require additional educational and scientific review. This is one of the major goals of the CCIC Teacher Workshop.

We hope that the Hot curriculum and simulation will prove to be a meaningful way for you and your students to engage in learning about Earth, and the intersections of science and society in the context of an important global issue – climate change. We also hope Hot is personally relevant students, and motivates a lifetime of interest and critical thinking about our planet and the special role humans have in the Earth system.

Carolyn Harris

Education Coordinator, Columbia University Earth Institute/NASA GISS & Founder, Real World Matters

Pushker Kharecha

Research Scientist, Columbia University Earth Institute/NASA GISS

Ryan Goble

Professional Development Leader Chicago Public Schools and Founder, Mindblue Productions

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UNIT I AT-A-GLANCE

Students engage in lessons where they develop some basic background knowledge about climate change drawing on research from scientists around the world. They will begin to develop key ideas that climate change is happening, we can observe it and it is a global problem. Students also begin to understand some of the lines of climate change evidence. More fundamentally, Unit I explores the relationship between climate and life, and helps students explain the difference between weather and climate.

Summative Assessment

Write a short news story using initial understandings developed in Unit I to describe the roles of humans and carbon in Earth's climate change story. The essay should accurately relate and explain at least one key climate science concept (e.g., difference between weather and climate) as well as 3 or more lines of climate change evidence. It should also express the influence of these roles in terms of time and spatial scale relevant to the climate change story.

National Education Standards Addressed

Learning objectives for each lesson relate to national education standards found in the Common Core State Standards (CCSS) and Next Generation Science Standards (NGSS). Each lesson identifies the specific standards addressed.

Unit I Learning Progression

Following input received from the 2013 Climate Change in the Classroom Teacher workshop, we will prepare a learning progression for the Unit. In its final form it will provide a short introduction and a lesson grid with brief summaries of student activities, learning objectives, standards addressed and performance assessments.

ENGAGE

Unit I Pre-Exploration & Assessment

TIME: 90 minutes or 2 class periods + homework



The diagnosis from one of Earth's "climate doctors" ...

Diagnosis: "We think something is wrong. We can detect that the temperature is warming and lots of things are changing...carbon dioxide and other greenhouse gases are warming the planet."

Prognosis: "What we can predict is things are going to get worse."

Treatment: "Think about ways to reduce carbon emissions."

- Gavin Schmidt, NASA Goddard Institute for Space Studies

overview

Students are introduced to the climate change problem through short videos from a noted climate scientist, the news, and cartoons.

objectives

The student will be able to...

- explain their current understandings about climate change
- identify questions about what they would like to learn

prerequisite

None

key vocabulary

Climate change attribution – a method scientists use to identify the various causes of climate change, including "fingerprints" of human-caused climate change.

Climate or weather extreme – reaching a high or highest degree, an event outside the range that we normally experience.

Mitigate – to make less severe or reduce the negative impacts.

differentiation guide

This lesson differentiates content, process, product based on student readiness, interests and learning profile. Full Articulation TBD

unit's student skill badges to earn

Academic knowledge / Social Emotional / Workforce and Global Citizenship / e.g., MacArthur "Open Badges" Full Articulation TBD

subjects

Earth & Environmental Science, Language Arts, Social Studies

standards

NGES ESS3.D Global Climate Change

Human activities affect global warming

CCSS ELA Literacy

Present information and findings (SL.4)

Determine the central idea from text and media (RI.2)

resources / materials

- Computers with Internet access
- LCD Projector with ability to stream video
- Hot video lecture I "The Big Climate Change Experiment" (5:53 minutes) (<http://goo.gl/Mk3gm>)
- ABC News: "The forecast is looking more and more extreme," (2:05 minutes) <http://youtu.be/atrl6CR6Lus?list=PLEB5BD521B9ED258F>
- Climate Change News and Political Cartoons web site, <http://goo.gl/jpzQo>

background

Earth is getting hotter. Our climate is changing. For decades, scientific research has indicated that increases in the amount of carbon dioxide (CO₂) in our atmosphere, primarily from burning fossil fuels, would cause the planet to warm. Among other damaging impacts, this warming will change rainfall and storm patterns around the world, raise sea level, and disrupt food and water supplies. All over the world, people are now experiencing these and other impacts of human-caused climate change. Higher summer temperatures and more severe droughts in the American Southwest are contributing to dangerous wildfire seasons. Record floods are hitting many places around the world, including South Asia and central and Western Europe. Decades of droughts in East Africa are worsening the food and humanitarian crisis in the region. Loss of mountain glaciers is threatening important sources of freshwater in South America and the Himalayas.

Scientists now have numerous lines of very strong evidence that indicate global climate is changing and human activities are the dominant cause. These lines of evidence are part of a vast body of scientific knowledge that developed over the past 150+ years from systematic measurements, observations and analysis.

Climate change is an important, evolving story. But how does climate change affect each of us? Unit one (and specifically lesson 1.1) is designed to assess what students already know about climate change, build background about the science of climate change and motivation to explore how climate change may impact students' lives.

suggested procedure

1. Give students the CLIMATE CHANGE PRE-ASSESSMENT on the student pages (over time we might host this as a Google doc form that we can share with teachers and use to collect data). Remind them that their responses to this self-assessment are not graded and will be used to see what they learn over the course of the unit. Briefly discuss students' answers in a large group.
 2. As a class, watch the Hot video: Lecture 1 The Big Climate Change Experiment. (5:53 minutes) where NASA Goddard Institute for Space Studies climate scientist, Dr. Gavin Schmidt, explains climate change using a medical analogy.
 3. Have the students respond to this video in box / "card" #1 on the THREE 4 THINKING student pages. Ask students to share out in pairs or to the whole group.
 4. Show the class the ABC News clip, "The forecast is looking more and more extreme." (2:05 minutes).
 5. Have the students respond to this video in box / "card" #2 on the THREE 4 THINKING students pages. Ask students to share out in pairs or to the whole group.
 6. Working in pairs or as a homework assignment, have students review 5-6 cartoons on the web site, "Climate Change News and Political Cartoons."
 7. Have the students respond to cartoons of their choosing in boxes / "cards" #3 & #4 on the THREE 4 THINKING student pages. Ask students to share out in pairs or to the whole group.
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wrap-up and discussion

Here is where students can reflect on and write a response to the following questions that they will present to the class: What are some of the themes in the videos and cartoons you reviewed? What seem to be the main factors concerning contributing to the climate change problem? Are there solutions or actions presented? If so, what are some examples? Students can present the responses to these questions in various ways – written statement, create a cartoon of their own, a skit, a short speech, etc.

Pre-assessment

Student response to the discussion prompts for the videos and class presentations.

Name: _____

Climate Change Pre-Assessment

Date: _____

Instructions: These four questions are designed to assess your knowledge about climate change **BEFORE** you explore the *Hot* curriculum. Your answers **will not** be graded. However, your responses to the questions will be collected to compare with your answer to the same questions at the end of Unit.

1. How does climate influence human society?

2. What is the difference between weather and climate?

3. How do scientists know climate is changing?

4. What are some important factors causing climate to change?

STUDENT PAGE LESSON 1.1 Pre-Exploration and Assessment

Name: _____

Three 4 Thinking Reflection LEO®

Date: _____

Use the following “notecards” to respond to each of the visual texts in Unit 1.1. Each “card” corresponds to a specific text. Please use one of the four prompts below to guide your responses.

“

Write down a quote or passage from the text that was meaningful to you. Remember, a quote can be anything – it does not just have to be something someone “said.” For example, if we quote from a Wikipedia entry it can be anything taken from that specific entry.



Write down an idea presented in the text that interested or intrigued you.

AH-HA

Write down an “ah-ha” moment you had when you were interacting with the text. An “ah-ha” moment is something you had never thought of before or something that suddenly became clear.



Write down a connection or “link” between the text and something else you’ve learned, read or studied, a personal experience or something you know about from the world.

TEXT: Hot lecture 1 “The Big Climate Change Experiment”

1.

Circle your choice of response

“.  . ?

TEXT: ABC News “The Forecast is Looking More and More Extreme”

2.

Circle your choice of response

AH-HA .  . ?

TEXT: Climate Change Cartoon #1 _____

3.

Circle your choice of response

AH-HA .  . ?

TEXT: Climate Change Cartoon #2 _____

4.

Circle your choice of response

“.  . ?

TEACHER NOTE: We recommend using these as four “notecards.” If students cut them out at the end of reading/viewing/listening to a text they can share their cards on the floor and sort them by themes and ideas (aka an affinity sort). That way the “Three 4 Thinking” cards become a differentiated tool for a kinesthetic whole-group discussion of the text that allows everyone’s voice to be heard.

This Learning Experience Organizer (LEO) is adapted from Mindblue’s “Three 4 Thinking” LEO ©201